

$\eta'(958)$ $I^G(J^{PC}) = 0^+(0^-+)$

NODE=M002

 $\eta'(958)$ MASS

NODE=M002M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
957.78 ±0.06 OUR AVERAGE				
957.793±0.054±0.036	3.9k	LIBBY 08	CLEO	$J/\psi \rightarrow \gamma\eta'$
957.9 ±0.2 ±0.6	4800	WURZINGER 96	SPEC	$1.68 pd \rightarrow {}^3\text{He}\eta'$
957.46 ±0.33		DUANE 74	MMS	$\pi^- p \rightarrow n\text{MM}$
958.2 ±0.5	1414	DANBURG 73	HBC	$2.2 K^- p \rightarrow \Lambda\eta'$
958 ±1	400	JACOBS 73	HBC	$2.9 K^- p \rightarrow \Lambda\eta'$
956.1 ±1.1	3415	¹ BASILE 71	CNTR	$1.6 \pi^- p \rightarrow nn\eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
957.5 ±0.2		BAI 04J	BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
959 ±1	630	² BELADIDZE 92C	VES	$36 \pi^- \text{Be} \rightarrow \pi^-\eta'\eta\text{Be}$
958 ±1	340	² ARMSTRONG 91B	OMEG	$300 pp \rightarrow pp\eta\pi^+\pi^-$
958.2 ±0.4	622	² AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
957.8 ±0.2	2420	² AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
956.3 ±1.0	143	² GIDAL 87	MRK2	$e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
957.4 ±1.4	535	³ BASILE 71	CNTR	$1.6 \pi^- p \rightarrow nn\eta'$
957 ±1		RITTENBERG 69	HBC	$1.7-2.7 K^- p$

¹ Using all η' decays.

2 Systematic uncertainty not estimated.

3 Using η' decays into neutrals. Not independent of the other listed BASILE 71 η' mass measurement. **$\eta'(958)$ WIDTH**

NODE=M002W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
0.198±0.009 OUR FIT					
[0.199 ± 0.009 MeV OUR 2012 FIT]					
0.230±0.021 OUR AVERAGE					
0.226±0.017±0.014	2300	CZERWINSKI 10	MMS		$pp \rightarrow pp\eta'$
0.40 ±0.22	4800	WURZINGER 96	SPEC		$1.68 pd \rightarrow {}^3\text{He}\eta'$
0.28 ±0.10	1000	BINNIE 79	MMS	0	$\pi^- p \rightarrow n\text{MM}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.20 ±0.04		BAI 04J	BES2		$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

 $\eta'(958)$ DECAY MODES

NODE=M002215;NODE=M002

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 \pi^+ \pi^- \eta$	(42.9 ±0.7) %	
$\Gamma_2 \rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	(29.1 ±0.5) %	
$\Gamma_3 \pi^0 \pi^0 \eta$	(22.2 ±0.8) %	
$\Gamma_4 \omega \gamma$	(2.75±0.23) %	
$\Gamma_5 \gamma \gamma$	(2.20±0.08) %	
$\Gamma_6 3\pi^0$	(2.14±0.20) × 10 ⁻³	
$\Gamma_7 \mu^+ \mu^- \gamma$	(1.08±0.27) × 10 ⁻⁴	
$\Gamma_8 \pi^+ \pi^- \mu^+ \mu^-$	< 2.2 × 10 ⁻⁴	90%
$\Gamma_9 \pi^+ \pi^- \pi^0$	(3.8 ±0.4) × 10 ⁻³	
$\Gamma_{10} \pi^0 \rho^0$	< 4 %	90%
$\Gamma_{11} 2(\pi^+ \pi^-)$	< 2.4 × 10 ⁻⁴	90%
$\Gamma_{12} \pi^+ \pi^- 2\pi^0$	< 2.5 × 10 ⁻³	90%
$\Gamma_{13} 2(\pi^+ \pi^-)$ neutrals	< 1 %	95%
$\Gamma_{14} 2(\pi^+ \pi^-)\pi^0$	< 1.9 × 10 ⁻³	90%
$\Gamma_{15} 2(\pi^+ \pi^-)2\pi^0$	< 1 %	95%

DESIG=1

DESIG=9

DESIG=2

DESIG=7

DESIG=6

DESIG=8

DESIG=20

DESIG=201

DESIG=121

DESIG=18

DESIG=131

DESIG=202

DESIG=132

DESIG=141

DESIG=15

Γ_{16}	$3(\pi^+ \pi^-)$	$< 5 \times 10^{-4}$	90%	DESIG=203
Γ_{17}	$\pi^+ \pi^- e^+ e^-$	$(2.4^{+1.3}_{-1.0}) \times 10^{-3}$		DESIG=10
Γ_{18}	$\pi^+ e^- \nu_e + \text{c.c.}$	$< 2.1 \times 10^{-4}$	90%	DESIG=204
Γ_{19}	$\gamma e^+ e^-$	$< 9 \times 10^{-4}$	90%	DESIG=28
Γ_{20}	$\pi^0 \gamma \gamma$	$< 8 \times 10^{-4}$	90%	DESIG=24
Γ_{21}	$4\pi^0$	$< 5 \times 10^{-4}$	90%	DESIG=26
Γ_{22}	$e^+ e^-$	$< 2.1 \times 10^{-7}$	90%	DESIG=150
Γ_{23}	invisible	$< 5 \times 10^{-4}$	90%	DESIG=200

**Charge conjugation (C), Parity (P),
Lepton family number (LF) violating modes**

Γ_{24}	$\pi^+ \pi^-$	P, CP	$< 6 \times 10^{-5}$	90%	DESIG=111
Γ_{25}	$\pi^0 \pi^0$	P, CP	$< 4 \times 10^{-4}$	90%	DESIG=25
Γ_{26}	$\pi^0 e^+ e^-$	C	$[a] < 1.4 \times 10^{-3}$	90%	DESIG=16
Γ_{27}	$\eta e^+ e^-$	C	$[a] < 2.4 \times 10^{-3}$	90%	DESIG=17
Γ_{28}	3γ	C	$< 1.0 \times 10^{-4}$	90%	DESIG=23
Γ_{29}	$\mu^+ \mu^- \pi^0$	C	$[a] < 6.0 \times 10^{-5}$	90%	DESIG=22
Γ_{30}	$\mu^+ \mu^- \eta$	C	$[a] < 1.5 \times 10^{-5}$	90%	DESIG=21
Γ_{31}	$e \mu$	LF	$< 4.7 \times 10^{-4}$	90%	DESIG=27

[a] C parity forbids this to occur as a single-photon process.

LINKAGE=CS

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, 2 combinations of partial widths obtained from integrated cross section, and 15 branching ratios uses 43 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 48.0$ for 35 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_2	x_3	x_4	x_5	x_6	x_9	x_{17}	
								x_1
x_2	0							
x_3	-76	-58						
x_4	-19	-23	4					
x_5	-29	-25	32	-1				
x_6	-24	-18	29	1	9			
x_9	0	-2	-3	-1	-1	-1		
x_{17}	-4	-6	-5	-2	-3	-2	0	
Γ	25	5	-19	5	-71	-5	1	3

	Mode	Rate (MeV)	
Γ_1	$\pi^+ \pi^- \eta$	0.085 ± 0.004	DESIG=1
Γ_2	$\rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	0.0575 ± 0.0028	DESIG=9
Γ_3	$\pi^0 \pi^0 \eta$	0.0439 ± 0.0023	DESIG=2
Γ_4	$\omega \gamma$	0.0054 ± 0.0005	DESIG=7
Γ_5	$\gamma \gamma$	0.00435 ± 0.00013	DESIG=6
Γ_6	$3\pi^0$	$(4.2 \pm 0.4) \times 10^{-4}$	DESIG=8
Γ_9	$\pi^+ \pi^- \pi^0$	$(7.5 \pm 0.8) \times 10^{-4}$	DESIG=121
Γ_{17}	$\pi^+ \pi^- e^+ e^-$	$(4.7 \pm 2.6) \times 10^{-4}$	DESIG=10

$\eta'(958)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$						Γ_5
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT		
4.35±0.14 OUR FIT						
[4.34 ± 0.14 keV OUR 2012 FIT]						
4.28±0.19 OUR AVERAGE						
4.17±0.10±0.27	2000	4 ACCIARRI	98Q L3	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \gamma$		
4.53±0.29±0.51	266	KARCH	92 CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$		
3.61±0.13±0.48		5 BEHREND	91 CELL	$e^+ e^- \rightarrow e^+ e^- \eta'(958)$		
4.6 ± 1.1 ± 0.6	23	BARU	90 MD1	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \gamma$		
4.57±0.25±0.44		BUTLER	90 MRK2	$e^+ e^- \rightarrow e^+ e^- \eta'(958)$		
5.08±0.24±0.71	547	6 ROE	90 ASP	$e^+ e^- \rightarrow e^+ e^- 2\gamma$		
3.8 ± 0.7 ± 0.6	34	AIHARA	88C TPC	$e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$		
4.9 ± 0.5 ± 0.5	136	7 WILLIAMS	88 CBAL	$e^+ e^- \rightarrow e^+ e^- 2\gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
4.7 ± 0.6 ± 0.9	143	8 GIDAL	87 MRK2	$e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$		
4.0 ± 0.9		9 BARTEL	85E JADE	$e^+ e^- \rightarrow e^+ e^- 2\gamma$		
4 No non-resonant $\pi^+ \pi^-$ contribution found.						
5 Reevaluated by us using $B(\eta' \rightarrow \rho(770)\gamma) = (30.2 \pm 1.3)\%$.						
6 Reevaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.						
7 Reevaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.						
8 Superseded by BUTLER 90.						
9 Systematic error not evaluated.						

NODE=M002220

NODE=M002W4

NODE=M002W4

NEW

 $\eta'(958) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

This combination of a partial width with the partial width into $\gamma\gamma$ and with the total width is obtained from the integrated cross section into channel(i) in the $\gamma\gamma$ annihilation.

$\Gamma(\gamma\gamma) \times \Gamma(\rho^0 \gamma \text{(including non-resonant } \pi^+ \pi^- \gamma)) / \Gamma_{\text{total}}$		$\Gamma_5 \Gamma_2 / \Gamma$				
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT		
1.27±0.04 OUR FIT						
1.26±0.07 OUR AVERAGE Error includes scale factor of 1.2.						
1.09±0.04±0.13		BEHREND	91 CELL	$e^+ e^- \rightarrow e^+ e^- \rho(770)^0 \gamma$		
1.35±0.09±0.21		AIHARA	87 TPC	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
1.13±0.04±0.13	867	ALBRECHT	87B ARG	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
1.53±0.09±0.21		ALTHOFF	84E TASS	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
1.14±0.08±0.11	243	BERGER	84B PLUT	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
1.73±0.34±0.35	95	JENNI	83 MRK2	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
1.49±0.13±0.027	213	BARTEL	82B JADE	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.85±0.31±0.24	43	BEHREND	83B CELL	$e^+ e^- \rightarrow e^+ e^- \rho \gamma$		

NODE=M002W4;LINKAGE=AC

NODE=M002W4;LINKAGE=K1

NODE=M002W4;LINKAGE=K2

NODE=M002W4;LINKAGE=K3

NODE=M002W4;LINKAGE=C

NODE=M002W4;LINKAGE=A

$\Gamma(\gamma\gamma) \times \Gamma(\pi^0 \pi^0 \eta) / \Gamma_{\text{total}}$		$\Gamma_5 \Gamma_3 / \Gamma$				
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT		
0.97±0.05 OUR FIT						
[0.94 ± 0.05 keV OUR 2012 FIT]						
0.92±0.06±0.11						
0.95±0.05±0.08		10 KARCH	92 CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$		
1.00±0.08±0.10		11 KARCH	90 CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$		
10 Reevaluated by us using $B(\eta \rightarrow \gamma\gamma) = (39.21 \pm 0.34)\%$. Supersedes ANTREASYAN 87 and KARCH 90.						
11 Superseded by KARCH 92.						
12 Using $BR(\eta \rightarrow 2\gamma) = (38.9 \pm 0.5)\%$.						

NODE=M002G1

NODE=M002G1

NEW

NODE=M002G2;LINKAGE=K4

NODE=M002G2;LINKAGE=A

NODE=M002G2;LINKAGE=D

$\eta'(958) \rightarrow \eta\pi\pi$ DECAY PARAMETERS

$$|\text{MATRIX ELEMENT}|^2 = |1 + \alpha Y|^2 + CX + DX^2$$

X and Y are Dalitz variables; α is complex and C, and D are real-valued. Parameters C and D are not necessarily equal to c and d, respectively, in the generalized parameterization following this one. May be different for $\eta'(958) \rightarrow \eta\pi^+\pi^-$ and $\eta'(958) \rightarrow \eta\pi^0\pi^0$ decays. Because of different initial assumptions and strong correlations of the parameters we do not average the parameters in the section below.

Re(α) decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.033 ± 0.005 ± 0.003	44k	13 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.072 ± 0.012 ± 0.006	7k	14 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
-0.021 ± 0.018 ± 0.017	6.7k	15 BRIERE	00 CLEO	$10.6e^+e^- \rightarrow \eta\pi^+\pi^-X$
-0.058 ± 0.013 ± 0.003	5.4k	16 ALDE	86 GAM2	$38\pi^-p \rightarrow n\eta\pi^0\pi^0$
-0.08 ± 0.03	16,17 KALBFLEISCH	74 RVUE		$\eta' \rightarrow \eta\pi^+\pi^-$

13 See ABLIKIM 11 for the full correlation matrix.

14 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

15 Assuming $\text{Im}(\alpha) = 0$, $C = 0$, and $D = 0$.

16 Assuming $C = 0$.

17 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

NODE=M002225

NODE=M002225

NODE=M002A0

NODE=M002A0

Im(α) decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.000 ± 0.049 ± 0.001	44k	18 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.0 ± 0.1 ± 0.0	7k	19 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
-0.00 ± 0.13 ± 0.00	5.4k	20 ALDE	86 GAM2	$38\pi^-p \rightarrow n\eta\pi^0\pi^0$
0.0 ± 0.3	20,21 KALBFLEISCH	74 RVUE		$\eta' \rightarrow \eta\pi^+\pi^-$

18 See ABLIKIM 11 for the full correlation matrix.

19 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

20 Assuming $C = 0$.

21 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

NODE=M002A0;LINKAGE=AB

NODE=M002A0;LINKAGE=AM

NODE=M002A0;LINKAGE=BR

NODE=M002A0;LINKAGE=A

NODE=M002A0;LINKAGE=KA

NODE=M002IA0

NODE=M002IA0

C decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.018 ± 0.009 ± 0.003	44k	22 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.020 ± 0.018 ± 0.004	7k	23 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$

22 See ABLIKIM 11 for the full correlation matrix.

23 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

NODE=M002IA0;LINKAGE=AB

NODE=M002IA0;LINKAGE=AM

NODE=M002IA0;LINKAGE=A

NODE=M002IA0;LINKAGE=KA

NODE=M002C0

NODE=M002C0

D decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.059 ± 0.012 ± 0.004	44k	24 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.066 ± 0.030 ± 0.015	7k	25 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
0.00 ± 0.03 ± 0.00	5.4k	26 ALDE	86 GAM2	$38\pi^-p \rightarrow n\eta\pi^0\pi^0$
0	26,27 KALBFLEISCH	74 RVUE		$\eta' \rightarrow \eta\pi^+\pi^-$

24 See ABLIKIM 11 for the full correlation matrix.

25 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

26 Assuming $C = 0$.

27 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

NODE=M002C0;LINKAGE=AB

NODE=M002C0;LINKAGE=AM

NODE=M002D0

NODE=M002D0

NODE=M002D0;LINKAGE=AB

NODE=M002D0;LINKAGE=AM

NODE=M002D0;LINKAGE=AL

NODE=M002D0;LINKAGE=KA

$\eta'(958) \rightarrow \eta\pi\pi$ DECAY PARAMETERS

$$|\text{MATRIX ELEMENT}|^2 \propto 1 + a Y + b Y^2 + c X + d X^2$$

X and Y are Dalitz variables and a, b, c, and d are real-valued parameters. May be different for $\eta'(958) \rightarrow \eta\pi^+\pi^-$ and $\eta'(958) \rightarrow \eta\pi^0\pi^0$ decays. We do not average measurements in the section below because parameter values from each experiment are strongly correlated.

a decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.047 ± 0.011 ± 0.003	44k	28 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.066 ± 0.016 ± 0.003	15k	29 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
-0.127 ± 0.016 ± 0.008	20k	30 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta'\pi^- A^*$

28 See ABLIKIM 11 for the full correlation matrix.

29 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.

30 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002227

NODE=M002227

NODE=M002DPA
NODE=M002DPA

b decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.069 ± 0.019 ± 0.009	44k	31 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.063 ± 0.028 ± 0.004	15k	32 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
-0.106 ± 0.028 ± 0.014	20k	33 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta'\pi^- A^*$

31 See ABLIKIM 11 for the full correlation matrix.

32 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.

33 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002DPA;LINKAGE=AB
NODE=M002DPA;LINKAGE=BL
NODE=M002DPA;LINKAGE=DO

NODE=M002DPB
NODE=M002DPB

c decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.019 ± 0.011 ± 0.003	44k	34 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.107 ± 0.096 ± 0.003	15k	35 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
0.015 ± 0.011 ± 0.014	20k	36 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta'\pi^- A^*$

34 See ABLIKIM 11 for the full correlation matrix.

35 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.

36 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002DPB;LINKAGE=AB
NODE=M002DPB;LINKAGE=BL
NODE=M002DPB;LINKAGE=DO

NODE=M002DPC
NODE=M002DPC

d decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.073 ± 0.012 ± 0.003	44k	37 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.018 ± 0.078 ± 0.006	15k	38 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
-0.082 ± 0.017 ± 0.008	20k	39 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta'\pi^- A^*$

37 See ABLIKIM 11 for the full correlation matrix.

38 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay. If $c \equiv 0$ from Bose-Einstein symmetry, $d = -0.067 \pm 0.020 \pm 0.003$.

39 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002DPC;LINKAGE=AB
NODE=M002DPC;LINKAGE=BL
NODE=M002DPC;LINKAGE=DO

NODE=M002DPD
NODE=M002DPD

$\eta'(958)\beta$ PARAMETER

$$|\text{MATRIX ELEMENT}|^2 = (1 + 2\beta Z)$$

See the "Note on η Decay Parameters" in our 1994 edition Physical Review D**50** 1173 (1994), p. 1454.

β decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-0.46 ± 0.22 OUR AVERAGE Error includes scale factor of 1.4.				
-0.59 ± 0.18	235	BLIK	08 GAMS	$32\pi^- p \rightarrow \eta' n$
-0.1 ± 0.3		ALDE	87B GAM2	$38\pi^- p \rightarrow n3\pi^0$

NODE=M002226

NODE=M002226

NODE=M002B0
NODE=M002B0

$\eta'(958)$ BRANCHING RATIOS

$\Gamma(\pi^+ \pi^- \eta)/\Gamma_{\text{total}}$	Γ_1/Γ				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.429±0.007 OUR FIT[0.434 ± 0.007 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.424±0.011±0.004 1.2k 40 PEDLAR 09 CLEO $J/\psi \rightarrow \gamma\eta'$ 40 Not independent of other η' branching fractions and ratios in PEDLAR 09.

$\Gamma(\pi^+ \pi^- \eta(\text{charged decay}))/\Gamma_{\text{total}}$	$0.286\Gamma_1/\Gamma$				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.1228±0.0020 OUR FIT[0.1240 ± 0.0020 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.123 ± 0.014	107	RITTENBERG	69	HBC	1.7–2.7 $K^- p$
0.10 ± 0.04	10	LONDON	66	HBC	2.24 $K^- p \rightarrow \Lambda 2\pi^+ 2\pi^- \pi^0$
0.07 ± 0.04	7	BADIER	65B	HBC	3 $K^- p$

$\Gamma(\pi^+ \pi^- \eta(\text{neutral decay}))/\Gamma_{\text{total}}$	$0.714\Gamma_1/\Gamma$				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.307±0.005 OUR FIT[0.310 ± 0.005 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.314±0.026 281 RITTENBERG 69 HBC 1.7–2.7 $K^- p$

$\Gamma(\rho^0 \gamma(\text{including non-resonant } \pi^+ \pi^- \gamma))/\Gamma_{\text{total}}$	Γ_2/Γ				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.291±0.006 OUR FIT[0.293 ± 0.006 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.287±0.007±0.004	0.2k	41 PEDLAR	09	CLEO	$J/\psi \rightarrow \gamma\eta'$
0.329±0.033	298	RITTENBERG	69	HBC	1.7–2.7 $K^- p$
0.2 ± 0.1	20	LONDON	66	HBC	2.24 $K^- p \rightarrow \Lambda\pi^+\pi^-\gamma$
0.34 ± 0.09	35	BADIER	65B	HBC	3 $K^- p$

41 Not independent of other η' branching fractions and ratios in PEDLAR 09.

$\Gamma(\rho^0 \gamma(\text{including non-resonant } \pi^+ \pi^- \gamma))/\Gamma(\pi^+ \pi^- \eta)$	Γ_2/Γ_1			
VALUE	DOCUMENT ID	TECN	COMMENT	

0.677±0.017 OUR FIT[0.676 ± 0.017 OUR 2012 FIT]**0.683±0.020 OUR AVERAGE**

0.677±0.024±0.011	PEDLAR	09	CLE3	$J/\psi \rightarrow \eta'\gamma$
0.69 ± 0.03	ABLIKIM	06E	BES2	$J/\psi \rightarrow \eta'\gamma$

$\Gamma(\rho^0 \gamma(\text{including non-resonant } \pi^+ \pi^- \gamma))/\Gamma(\pi^+ \pi^- \eta(\text{neutral decay}))$	$\Gamma_2/0.714\Gamma_1$				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.949±0.024 OUR FIT[0.947 ± 0.024 OUR 2012 FIT]**0.97 ± 0.09 OUR AVERAGE**

0.70 ± 0.22	AMSLER	04B	CBAR	$0 \bar{p} p \rightarrow \pi^+ \pi^- \eta$	
1.07 ± 0.17	BELADIDZE	92C	VES	$36 \pi^- \text{Be} \rightarrow \pi^- \eta' \text{Be}$	
0.92 ± 0.14	473	DANBURG	73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$
1.11 ± 0.18	192	JACOBS	73	HBC	2.9 $K^- p \rightarrow \Lambda X^0$

$\Gamma(\pi^0 \pi^0 \eta)/\Gamma_{\text{total}}$	Γ_3/Γ				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.222±0.008 OUR FIT[0.216 ± 0.008 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.235±0.013±0.004 3.2k 42 PEDLAR 09 CLEO $J/\psi \rightarrow \gamma\eta'$ 42 Not independent of other η' branching fractions and ratios in PEDLAR 09.

NODE=M002230

NODE=M002R47
NODE=M002R47
NEW

NODE=M002R47;LINKAGE=PE

NODE=M002R3
NODE=M002R3
NEWNODE=M002R1
NODE=M002R1
NEWNODE=M002R6
NODE=M002R6
NEW

NODE=M002R6;LINKAGE=PE

NODE=M002R43
NODE=M002R43
NEWNODE=M002R27
NODE=M002R27
NEWNODE=M002R48
NODE=M002R48
NEW

NODE=M002R48;LINKAGE=PE

$\Gamma(\pi^0\pi^0\eta(3\pi^0 \text{decay}))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.0712±0.0026 OUR FIT

[0.0694 ± 0.0026 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.11 ± 0.06 4 BENSINGER 70 HBC 2.2 $\pi^+ p$

0.321Γ₃/Γ

NODE=M002R26

NODE=M002R26

NEW

 $\Gamma(\pi^0\pi^0\eta)/\Gamma(\pi^+\pi^-\eta)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.517±0.026 OUR FIT

[0.498 ± 0.025 OUR 2012 FIT]

0.555±0.043±0.013

PEDLAR 09 CLE3 $J/\psi \rightarrow \eta' \gamma$

Γ₃/Γ₁

NODE=M002R45

NODE=M002R45

NEW

 $\Gamma(\rho^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))/\Gamma(\pi\pi\eta)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.447±0.012 OUR FIT

[0.451 ± 0.012 OUR 2012 FIT]

0.43 ±0.02 ±0.02

BARBERIS 98C OMEG 450 $p p \rightarrow p_f \eta' p_s$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.31 ± 0.15 DAVIS 68 HBC 5.5 $K^- p$

Γ₂/(Γ₁+Γ₃)

NODE=M002R7

NODE=M002R7

NEW

 $\Gamma(\omega\gamma)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.0275±0.0023 OUR FIT

[0.0275 ± 0.0022 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0234±0.0030±0.0004 70 43 PEDLAR 09 CLEO $J/\psi \rightarrow \gamma \eta'$

43 Not independent of other η' branching fractions and ratios in PEDLAR 09.

Γ₄/Γ

NODE=M002R49

NODE=M002R49

NEW

 $\Gamma(\omega\gamma)/\Gamma(\pi^+\pi^-\eta)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.064±0.006 OUR FIT

[0.063 ± 0.005 OUR 2012 FIT]

0.055±0.007±0.001

PEDLAR 09 CLE3 $J/\psi \rightarrow \eta' \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.068±0.013 68 ZANFINO 77 ASPK 8.4 $\pi^- p$

Γ₄/Γ₁

NODE=M002R17

NODE=M002R17

NEW

 $\Gamma(\omega\gamma)/\Gamma(\pi^0\pi^0\eta)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.124±0.011 OUR FIT

[0.127 ± 0.011 OUR 2012 FIT]

0.147±0.016

ALDE 87B GAM2 38 $\pi^- p \rightarrow n 4\gamma$

Γ₄/Γ₃

NODE=M002R33

NODE=M002R33

NEW

 $\Gamma(\rho^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))/[\Gamma(\pi^+\pi^-\eta) + \Gamma(\pi^0\pi^0\eta) +$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

Γ₄/Γ₃]

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

0.428±0.011 OUR FIT

[0.433 ± 0.012 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.25 ± 0.14 DAUBER 64 HBC 1.95 $K^- p$

NODE=M002R18

NODE=M002R18

NEW

 $[\Gamma(\pi^0\pi^0\eta(\text{charged decay})) + \Gamma(\omega(\text{charged decay})\gamma)]/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

(0.286Γ₃+0.89Γ₄)/Γ

0.0880±0.0031 OUR FIT

[0.0863 ± 0.0032 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.045 ± 0.029 42 RITTENBERG 69 HBC 1.7–2.7 $K^- p$

NODE=M002R4

NODE=M002R4

NEW

 $\Gamma(\pi^+\pi^- \text{ neutrals})/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

(0.714Γ₁+0.286Γ₃+0.89Γ₄)/Γ

0.395±0.004 OUR FIT

[0.396 ± 0.004 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.4 ± 0.1 39 LONDON 66 HBC 2.24 $K^- p \rightarrow \Lambda \pi^+ \pi^- \text{ neutrals}$

0.35 ± 0.06 33 BADIER 65B HBC 3 $K^- p$

NODE=M002R2

NODE=M002R2

NEW

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
2.20 ± 0.08 OUR FIT [(2.18 ± 0.08) $\times 10^{-2}$ OUR 2012 FIT]					

 2.00 ± 0.15 OUR AVERAGE

$1.98^{+0.31}_{-0.27} \pm 0.07$	114	⁴⁴ WICHT	08	BELL	$B^\pm \rightarrow K^\pm \gamma\gamma$
2.00 ± 0.18		⁴⁵ STANTON	80	SPEC	$8.45 \pi^- p \rightarrow n\pi^+\pi^- 2\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.25 \pm 0.16 \pm 0.03$	0.3k	⁴⁶ PEDLAR	09	CLEO	$J/\psi \rightarrow \gamma\eta'$
1.8 ± 0.2	6000	⁴⁷ APEL	79	NICE	$15-40 \pi^- p \rightarrow n2\gamma$
2.5 ± 0.7		DUANE	74	MMS	$\pi^- p \rightarrow n\text{MM}$
1.71 ± 0.33	68	DALPIAZ	72	CNTR	$1.6 \pi^- p \rightarrow nX^0$
$2.0^{+0.8}_{-0.6}$	31	HARVEY	71	OSPK	$3.65 \pi^- p \rightarrow nX^0$

⁴⁴ WICHT 08 reports $[\Gamma(\eta'(958) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta' K^+)] = (1.40^{+0.16}_{-0.15} \pm 0.15) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta' K^+) = (7.06 \pm 0.25) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴⁵ Includes APEL 79 result.

⁴⁶ Not independent of other η' branching fractions and ratios in PEDLAR 09.

⁴⁷ Data is included in STANTON 80 evaluation.

$\Gamma(\gamma\gamma)/\Gamma(\pi^+\pi^-\eta)$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ_1
0.0513 ± 0.0022 OUR FIT [0.0503 ± 0.0022 OUR 2012 FIT]					

0.053 $\pm 0.004 \pm 0.001$ PEDLAR 09 CLE3 $J/\psi \rightarrow \eta'\gamma$

$\Gamma(\gamma\gamma)/\Gamma(\rho^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ_2
0.0757 ± 0.0033 OUR FIT [0.0744 ± 0.0033 OUR 2012 FIT]					

0.080 ± 0.008 ABLIKIM 06E BES2 $J/\psi \rightarrow \eta'\gamma$

$\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0\eta)$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ_3
0.099 ± 0.004 OUR FIT [0.101 ± 0.004 OUR 2012 FIT]					

0.105 ± 0.010 OUR AVERAGE Error includes scale factor of 1.9.

0.091 ± 0.009 AMSLER 93 CBAR 0.0 $\bar{p}p$

$0.112 \pm 0.002 \pm 0.006$ ALDE 87B GAM2 38 $\pi^- p \rightarrow n2\gamma$

$\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0\eta(\text{neutral decay}))$	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_5/0.714\Gamma_3$
0.139 ± 0.006 OUR FIT [0.141 ± 0.006 OUR 2012 FIT]					

• • • We do not use the following data for averages, fits, limits, etc. **• • •**

0.188 ± 0.058 APEL 16 OSPK 72 $3.8 \pi^- p \rightarrow nX^0$

$\Gamma(\text{ neutrals})/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	COMMENT	$(0.714\Gamma_3 + 0.09\Gamma_4 + \Gamma_5)/\Gamma$
0.183 ± 0.006 OUR FIT [0.179 ± 0.006 OUR 2012 FIT]					

• • • We do not use the following data for averages, fits, limits, etc. **• • •**

0.185 ± 0.022 BASILE 71 CNTR $1.6 \pi^- p \rightarrow nX^0$
 0.189 ± 0.026 RITTENBERG 69 HBC $1.7-2.7 K^- p$

$\Gamma(3\pi^0)/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
2.14 ± 0.20 OUR FIT $3.56 \pm 0.22 \pm 0.34$	309	ABLIKIM	12E	BES3	$J/\psi \rightarrow \gamma(3\pi^0)$

NODE=M002R19

NODE=M002R19

NEW

NODE=M002R19;LINKAGE=WI

NODE=M002R19;LINKAGE=S

NODE=M002R19;LINKAGE=PE

NODE=M002R19;LINKAGE=A

NODE=M002R46

NODE=M002R46

NEW

NODE=M002R42

NODE=M002R42

NEW

NODE=M002R38

NODE=M002R38

NEW

NODE=M002R28

NODE=M002R28

NEW

NODE=M002R5

NODE=M002R5

NEW

NODE=M002R55

NODE=M002R55

NEW

$\Gamma(3\pi^0)/\Gamma(\pi^0\pi^0\eta)$		Γ_6/Γ_3					
<u>VALUE</u> (units 10^{-4})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
96± 9 OUR FIT							
[(78 ± 10) × 10 ⁻⁴ OUR 2012 FIT]							
78±10 OUR AVERAGE							
86±19	235	BLIK	08	GAMS	$32 \pi^- p \rightarrow \eta' n$		
74±15		ALDE	87B	GAM2	$38 \pi^- p \rightarrow n6\gamma$		
75±18		BINON	84	GAM2	$30\text{--}40 \pi^- p \rightarrow n6\gamma$		

$\Gamma(\mu^+\mu^-\gamma)/\Gamma(\gamma\gamma)$		Γ_7/Γ_5			
<u>VALUE</u> (units 10^{-3})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
4.9±1.2	33	VIKTOROV	80	CNTR	$25,33 \pi^- p \rightarrow 2\mu\gamma$

$\Gamma(\pi^+\pi^-\mu^+\mu^-)/\Gamma_{\text{total}}$		Γ_8/Γ			
<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<2.4 90 48 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

48 Not independent of measured value of Γ_8/Γ_1 from NAIK 09.

$\Gamma(\pi^+\pi^-\mu^+\mu^-)/\Gamma(\pi^+\pi^-\eta)$		Γ_8/Γ_1			
<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.5	90	49 NAIK	09	CLEO	$J/\psi \rightarrow \gamma\eta'$

49 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\mu^+\mu^-)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 1.3 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$		Γ_9/Γ			
<u>VALUE</u> (units 10^{-3})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.8 ±0.4 OUR FIT					

[(0.36^{+0.11}_{-0.09}) × 10⁻² OUR 2012 FIT]

3.8 ±0.4 OUR AVERAGE

3.83±0.15±0.39	1014	ABLIKIM	12E	BES3	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^0)$
3.7 ^{+1.1} _{-0.9} ±0.4		50 NAIK	09	CLEO	$J/\psi \rightarrow \gamma\eta'$

50 Not independent of measured value of Γ_9/Γ_1 from NAIK 09.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\pi^+\pi^-\eta)$		Γ_9/Γ_1			
<u>VALUE</u> (units 10^{-3})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
8.8 ±0.9 OUR FIT					

[(8.3^{+2.5}_{-2.1}) × 10⁻³ OUR 2012 FIT]

8.28^{+2.49}_{-2.12} ±0.04 20 51 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

51 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] = (21⁺⁶₋₅ ± 2) \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^0\rho^0)/\Gamma_{\text{total}}$		Γ_{10}/Γ			
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.04	90	RITTENBERG 65	HBC	2.7 $K^- p$	

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$		Γ_{11}/Γ			
<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					

< 2.4 90 52 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$
< 100 90 RITTENBERG 69 HBC 1.7–2.7 $K^- p$

52 Not independent of measured value of Γ_{11}/Γ_1 from NAIK 09.

$\Gamma(2(\pi^+\pi^-))/\Gamma(\pi^+\pi^-\eta)$		Γ_{11}/Γ_1			
<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.6	90	53 NAIK	09	CLEO	$J/\psi \rightarrow \gamma\eta'$

53 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 2(\pi^+\pi^-))/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 1.4 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

NODE=M002R32

NODE=M002R32

NEW

NODE=M002R29
NODE=M002R29

NODE=M002R50
NODE=M002R50

NODE=M002R03
NODE=M002R03

NODE=M002R21
NODE=M002R21

NEW

NODE=M002R21;LINKAGE=NA
NODE=M002R01
NODE=M002R01

NEW

NODE=M002R01;LINKAGE=NA
NODE=M002R24
NODE=M002R24

NEW

NODE=M002R24;LINKAGE=NA
NODE=M002R04
NODE=M002R04

NEW

$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<27	90	54 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
54 Not independent of measured value of Γ_{12}/Γ_1 from NAIK 09.				

 $\Gamma(\pi^+\pi^-2\pi^0)/\Gamma(\pi^+\pi^-\eta)$ Γ_{12}/Γ_1

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<6	90	55 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
55 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-2\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 15 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.				

 $\Gamma(2(\pi^+\pi^-)\text{ neutrals})/\Gamma_{\text{total}}$ Γ_{13}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.01	95	DANBURG	73 HBC	$2.2 K^- p \rightarrow \Lambda X^0$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.01	90	RITTENBERG	69 HBC	$1.7-2.7 K^- p$

 $\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$ Γ_{14}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.002	90	56 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
<0.01	90	RITTENBERG	69 HBC	$1.7-2.7 K^- p$

56 Not independent of measured value of Γ_{14}/Γ_1 from NAIK 09. $\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma(\pi^+\pi^-\eta)$ Γ_{14}/Γ_1

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4	90	57 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
57 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 2(\pi^+\pi^-)\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 11 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.				

 $\Gamma(2(\pi^+\pi^-)2\pi^0)/\Gamma_{\text{total}}$ Γ_{15}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.01	95	KALBFLEISCH	64B HBC	$K^- p \rightarrow \Lambda 2(\pi^+\pi^-)+\text{MM}$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.01	90	LONDON	66 HBC	Compilation

 $\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$ Γ_{16}/Γ

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.53	90	58 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
<5	95	KALBFLEISCH	64B HBC	$K^- p \rightarrow \Lambda 2(\pi^+\pi^-)$

58 Not independent of measured value of Γ_{16}/Γ_1 from NAIK 09. $\Gamma(3(\pi^+\pi^-))/\Gamma(\pi^+\pi^-\eta)$ Γ_{16}/Γ_1

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1.2	90	59 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
59 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 3(\pi^+\pi^-))/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 3.0 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.				

 $\Gamma(\pi^+\pi^-e^+e^-)/\Gamma_{\text{total}}$ Γ_{17}/Γ

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$2.4^{+1.3}_{-1.0}$ OUR FIT				
<6	90	RITTENBERG	65 HBC	$2.7 K^- p$

60 Not independent of measured value of Γ_{17}/Γ_1 from NAIK 09.NODE=M002R51
NODE=M002R51

NODE=M002R51;LINKAGE=NA

NODE=M002R05
NODE=M002R05

NODE=M002R05;LINKAGE=NA

NODE=M002R22
NODE=M002R22NODE=M002R23
NODE=M002R23NODE=M002R06
NODE=M002R06

NODE=M002R06;LINKAGE=NA

NODE=M002R16
NODE=M002R16NODE=M002R07
NODE=M002R07NODE=M002R08
NODE=M002R08

NODE=M002R08;LINKAGE=NA

NODE=M002R12
NODE=M002R12

NODE=M002R12;LINKAGE=NA

$\Gamma(\pi^+\pi^-e^+e^-)/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{17}/Γ_1</u>
---	-------------	--------------------	-------------	----------------	--

5.6 $+3.0$ -2.2 OUR FIT

5.52 $^{+3.00}_{-2.30}$ ± 0.03 8 61 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

61 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-e^+e^-)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] = (14^{+7}_{-5} \pm 3) \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\pi^+e^-\nu_e+c.c.)/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{18}/Γ_1</u>
<5.0	90	ABLIKIM	13G	BES3	$J/\psi \rightarrow \phi\eta'$

 $\Gamma(\gamma e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{19}/Γ</u>
<0.9	90	BRIERE	00	CLEO	$10.6 e^+e^-$

 $\Gamma(\pi^0\gamma\gamma)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{20}/Γ_3</u>
<37	90	ALDE	87B	GAM2	$38 \pi^- p \rightarrow n4\gamma$

 $\Gamma(4\pi^0)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{21}/Γ_3</u>
<23	90	ALDE	87B	GAM2	$38 \pi^- p \rightarrow n8\gamma$

 $\Gamma(e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-7})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{22}/Γ</u>
<2.1	90	VOROBYEV	88	ND	$e^+e^- \rightarrow \pi^+\pi^-\eta$

 $\Gamma(\text{invisible})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{23}/Γ</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<9.5 90 62 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

62 Not independent of measured value of Γ_{23}/Γ_1 from NAIK 09.

 $\Gamma(\text{invisible})/\Gamma(\gamma\gamma)$

<u>VALUE (units 10^{-2})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{23}/Γ_5</u>
<2.4 (CL = 90%)	[$<6.69 \times 10^{-2}$ (CL = 90%) OUR 2008 BEST LIMIT]				

<2.4 90 ABLIKIM 13 BES3 $J/\psi \rightarrow \phi\eta'$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<6.69 90 ABLIKIM 06Q BES $J/\psi \rightarrow \phi\eta'$

 $\Gamma(\text{invisible})/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{23}/Γ_1</u>
---	------------	--------------------	-------------	----------------	--

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2.1 90 63 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

63 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \text{invisible})/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 5.4 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

 $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{24}/Γ</u>
< 0.6	90	64 ABLIKIM	11G	BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 29 90 65 MORI 07A BELL $\gamma\gamma \rightarrow \pi^+\pi^-$

< 3.3 90 66 MORI 07A BELL $\gamma\gamma \rightarrow \pi^+\pi^-$

<800 95 DANBURG 73 HBC 2.2 $K^- p \rightarrow \Lambda X^0$

<200 90 RITTENBERG 69 HBC 1.7–2.7 $K^- p$

64 ABLIKIM 11G reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta'(958))] \times 2.84 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta'(958)) = 5.15 \times 10^{-3}$.

65 Taking into account interference with the $\gamma\gamma \rightarrow \pi^+\pi^-$ continuum.

66 Without interference with the $\gamma\gamma \rightarrow \pi^+\pi^-$ continuum.

NODE=M002R02

NODE=M002R02

NODE=M002R02;LINKAGE=NA

NODE=M002R54

NODE=M002R54

NODE=M002R35

NODE=M002R35

NODE=M002R37

NODE=M002R37

NODE=M002R39

NODE=M002R39

NODE=M002R52

NODE=M002R52

NODE=M002R09

NODE=M002R09

OCCUR=2

NODE=M002R20;LINKAGE=AL

NODE=M002R20;LINKAGE=MO

NODE=M002R20;LINKAGE=MR

$\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_{25}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<4 \times 10^{-4}$	90	67	ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^0\pi^0$ 67 ABLIKIM 11G reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta'(958))]$ $< 2.84 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta'(958)) = 5.15 \times 10^{-3}$.
$\Gamma(\pi^0\pi^0)/\Gamma(\pi^0\pi^0\eta)$					
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{25}/Γ_3
<45	90	ALDE	87B	GAM2	$38\pi^- p \rightarrow n4\gamma$
$\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$					
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{26}/Γ
<1.4	90	BRIERE	00	CLEO	$10.6 e^+e^-$ • • • We do not use the following data for averages, fits, limits, etc. • • •
<13	90	RITTENBERG	65	HBC	$2.7 K^- p$
$\Gamma(\eta e^+e^-)/\Gamma_{\text{total}}$					
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{27}/Γ
<2.4	90	BRIERE	00	CLEO	$10.6 e^+e^-$ • • • We do not use the following data for averages, fits, limits, etc. • • •
<11	90	RITTENBERG	65	HBC	$2.7 K^- p$
$\Gamma(3\gamma)/\Gamma(\pi^0\pi^0\eta)$					
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{28}/Γ_3
<4.6	90	ALDE	87B	GAM2	$38\pi^- p \rightarrow n3\gamma$
$\Gamma(\mu^+\mu^-\pi^0)/\Gamma_{\text{total}}$					
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{29}/Γ
<6.0	90	DZHELYADIN	81	CNTR	$30\pi^- p \rightarrow \eta' n$
$\Gamma(\mu^+\mu^-\eta)/\Gamma_{\text{total}}$					
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{30}/Γ
<1.5	90	DZHELYADIN	81	CNTR	$30\pi^- p \rightarrow \eta' n$
$\Gamma(e\mu)/\Gamma_{\text{total}}$					
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{31}/Γ
<4.7	90	BRIERE	00	CLEO	$10.6 e^+e^-$

$\eta'(958)$ C-NONCONSERVING DECAY PARAMETER

See the note on η decay parameters in the Stable Particle Particle Listings for definition of this parameter.

DECAY ASYMMETRY PARAMETER FOR $\pi^+\pi^-\gamma$				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-0.03 ± 0.04 OUR AVERAGE				
-0.019 ± 0.056		AIHARA	87	$2\gamma \rightarrow \pi^+\pi^-\gamma$
-0.069 ± 0.078	295	GRIGORIAN	75	$2.1\pi^-p$
0.00 ± 0.10	103	KALBFLEISCH	75	HBC $2.18K^-p \rightarrow \Lambda\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.07 ± 0.08	152	RITTENBERG	65	HBC $2.1-2.7K^-p$

$\eta'(958)$ REFERENCES				
ABLIKIM	13	PR D87 012009	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13G	PR D87 032006	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12E	PRL 108 182001	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11	PR D83 012003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11G	PR D84 032006	M. Ablikim <i>et al.</i>	(BES III Collab.)
CZERWINSKI	10	PRL 105 122001	E. Czerwinski <i>et al.</i>	(COSY-11 Collab.)
BLIK	09	PAN 72 231	A.M. Blik <i>et al.</i>	(IHEP (Protvino))
		Translated from YAF 72 238.		
NAIK	09	PRL 102 061801	P. Naik <i>et al.</i>	(CLEO Collab.)
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)
BLIK	08	PAN 71 2124	A. Blik <i>et al.</i>	(GAMS-4 π Collab.)
		Translated from YAF 71 2161.		

LIBBY	08	PRL 101 182002	J. Libby <i>et al.</i>	(CLEO Collab.)	REFID=52591
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52204
DOROFEEV	07	PL B651 22	V. Dorofeev <i>et al.</i>	(VES Collab.)	REFID=51711
MORI	07A	JPSJ 76 074102	T. Mori <i>et al.</i>	(BELLE Collab.)	REFID=51691
ABLIKIM	06E	PR D73 052008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51057
ABLIKIM	06Q	PRL 97 202002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51487
AMELIN	05A	PAN 68 372	D.V. Amelin <i>et al.</i>	(VES Collab.)	REFID=50766
Translated from YAF 68 401.					
AMSLER	04B	EPJ C33 23	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=51079
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50167
BRIERE	00	PRL 84 26	R. Briere <i>et al.</i>	(CLEO Collab.)	REFID=47410
ACCIARRI	98Q	PL B418 399	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=46316
BARBERIS	98C	PL B440 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=46346
WURZINGER	96	PL B374 283	R. Würzinger <i>et al.</i>	(BONN, ORSAY, SACL+)	REFID=44992
PDG	94	PR D50 1173	L. Montanet <i>et al.</i>	(CERN, LBL, BOST+)	REFID=43653
AMSLER	93	ZPHY C58 175	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43311
BELADIDZE	92C	SJNP 55 1535	G.M. Beladidze, S.I. Bityukov, G.V. Borisov	(SERP+)	REFID=43175
Translated from YAF 55 2748.					
KARCH	92	ZPHY C54 33	K. Karch <i>et al.</i>	(Crystal Ball Collab.)	REFID=42170
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRMP+)	REFID=41862
BEHREND	91	ZPHY C49 401	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=41497
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=41352
BARU	90	ZPHY C48 581	S.E. Baru <i>et al.</i>	(MD-1 Collab.)	REFID=41366
BUTTLER	90	PR D42 1368	F. Butler <i>et al.</i>	(Mark II Collab.)	REFID=41363
KARCH	90	PL B249 353	K. Karch <i>et al.</i>	(Crystal Ball Collab.)	REFID=41377
ROE	90	PR D41 17	N.A. Roe <i>et al.</i>	(ASP Collab.)	REFID=41014
AIHARA	88C	PR D38 1	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)	REFID=40564
VOROBIEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=41023
Translated from YAF 48 436.					
WILLIAMS	88	PR D38 1365	D.A. Williams <i>et al.</i>	(Crystal Ball Collab.)	REFID=40567
AIHARA	87	PR D35 2650	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.) JP	REFID=40009
ALBRECHT	87B	PL B199 457	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40265
ALDE	87B	ZPHY C36 603	D.M. Alde <i>et al.</i>	(LANL, BELG, SERP, LAPP)	REFID=40236
ANTREASYAN	87	PR D36 2633	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)	REFID=40008
GIDAL	87	PR D 59 2012	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)	REFID=40223
ALDE	86	PL B177 115	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP)	REFID=20310
BARTEL	85E	PL 160B 421	W. Bartel <i>et al.</i>	(JADE Collab.)	REFID=10843
ALTHOFF	84E	PL 147B 487	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=20305
BERGER	84B	PL 142B 125	C. Berger	(PLUTO Collab.)	REFID=20306
BINON	84	PL 140B 264	F.G. Binon <i>et al.</i>	(SERP, BELG, LAPP+)	REFID=20307
BEHREND	83B	PL 125B 518 (erratum) Also PL 114B 378	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=20302
JENNI	83	PR D27 1031	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=20303
BARTEL	82B	PL 113B 190	W. Bartel <i>et al.</i>	(SLAC, LBL)	REFID=20304
DZHELYADIN	81	PL 105B 239	R.I. Dzhelyadin <i>et al.</i>	(JADE Collab.)	REFID=20300
STANTON	80	PL B92 353	N.R. Stanton <i>et al.</i>	(SERP)	REFID=10836
VIKTOROV	80	SJNP 32 520	V.A. Viktorov <i>et al.</i>	(OSU, CARL, MCGI+)	REFID=40294
Translated from YAF 32 1005.					REFID=20298
APEL	79	PL 83B 131	W.D. Apel, K.H. Augenstein, E. Bertolucci	(KARLK+)	REFID=20295
BINNIE	79	PL 83B 141	D.M. Binnie <i>et al.</i>	(LOIC)	REFID=20296
ZANFINO	77	PRL 38 930	C. Zanfino <i>et al.</i>	(CARL, MCGI, OHIO+)	REFID=20293
GRIGORIAN	75	NP B91 232	A. Grigorian <i>et al.</i>	(+)	REFID=20287
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)	REFID=20223
DUANE	74	PRL 32 425	A. Duane <i>et al.</i>	(LOIC, SHMP)	REFID=20284
KALBFLEISCH	74	PR D10 916	G.R. Kalbfleisch	(BNL)	REFID=20286
DANBURG	73	PR D8 3744	J.S. Danburg <i>et al.</i>	(BNL, MICH) JP	REFID=20280
JACOBS	73	PR D8 18	S.M. Jacobs <i>et al.</i>	(BRAN, UMD, SYRA+) JP	REFID=20281
AGUILAR-...	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)	REFID=20205
APEL	72	PL 40B 680	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA)	REFID=20275
DALPIAZ	72	PL 42B 377	P.F. Dalpiatz <i>et al.</i>	(CERN)	REFID=20278
BASILE	71	NC 3A 371	M. Basile <i>et al.</i>	(CERN, BGNA, STRB)	REFID=20270
HARVEY	71	PRL 27 885	E.H. Harvey <i>et al.</i>	(MINN, MICH)	REFID=20272
BENSINGER	70	PL 33B 505	J.R. Bensinger <i>et al.</i>	(WISC)	REFID=20268
RITTENBERG	69	Thesis UCRL 18863	A. Rittenberg	(LRL) I	REFID=20266
DAVIS	68	PL 27B 532	R. Davis <i>et al.</i>	(NWES, ANL)	REFID=20263
LONDON	66	PR 143 1034	G.W. London <i>et al.</i>	(BNL, SYRA) IJP	REFID=11774
BADIER	65B	PL 17 337	J. Badier <i>et al.</i>	(EPOL, SACL, AMST)	REFID=20253
RITTENBERG	65	PRL 15 556	A. Rittenberg, G.R. Kalbfleisch	(LRL, BNL)	REFID=10761
DAUBER	64	PRL 13 449	P.M. Dauber <i>et al.</i>	(UCLA) JP	REFID=20247
KALBFLEISCH	64B	PRL 13 349	G.R. Kalbfleisch, O.I. Dahl, A. Rittenberg	(LRL) JP	REFID=20252